THE IDENTITY OF AEDES BIMACULATUS (COQUILLETT) AND A NEW SUBSPECIES OF AEDES FULVUS (WIEDEMANN) FROM THE UNITED STATES (Diptera, Culicidae)

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This paper presents evidence to show that two distinct species of *Aedes* occurring in the United States are both at present identified as Coquillett's *bimaculatus*. The true *bimaculatus*, described from Brownsville, Texas, and ranging from central Texas to El Salvador, is very distinct from the "*bimaculatus*" collected throughout the southeastern United States which is here described as a new subspecies of the Neotropical *fulvus* (Wiedemann). Vargas' *rozeboomi*, recently described from Campeche, Mexico, is shown to be a synonym of the true *bimaculatus*.

The *bimaculatus* series upon which this study is largely based was collected by Lt. H. R. Roberts and the writer at the type locality, Brownsville, Texas. It consists of a large number of each sex, the identity of which was confirmed by the writer's comparison of females with Coquillett's holotype in the U. S. National Museum. The U. S. National Museum collection of the *fulvus* group was also utilized.

The purpose of this paper is to clarify these names and to make known the adult and fourth-instar larval characters of topotypic *bimaculatus*, as well as those of *fulvus* and its new subspecies from the United States.

Aedes (Ochlerotatus) bimaculatus (Coquillett).

(Figures 2 and 3.)

Culex bimaculatus Coquillett, 1902, Proc. U. S. Nat. Mus., 25:84; Dyar, 1903, Proc. Ent. Soc. Wash., 5:147.

Aedes bimaculatus (Coquillett), Howard, Dyar, and Knab, 1917, Mosq. No. and Cent. Amer., and W. I., 4:622 (*ex parte*)

Ochlerotatus bimaculatus (Coquillett), 1906, U. S. Dept. Agric., Bur. Ent., Tech. Ser. 11, p. 18.

Aedes (*Heteronycha*) *bimaculatus* (Coquillett), Dyar, 1920, Ins. Insc. Mens. 8:105 (list); Dyar, 1920, Proc. U. S. Nat. Mus., 62:48 (*ex parte*).

Aedes (*Ochlerotatus*) *bimaculatus* (Coquillett), Vargas, 1940, Rev. Soc. Mex. Hist. Nat., 1:104, figs.

Aedes (*Ochlerotatus*) *fulvus* (Wiedemann), Dyar, 1922, Ins. Insc. Mens., 10:158 (in error); Dyar, 1928, Mosq. Amer., p. 154 (in error).

Aedes (*Ochlerotatus*) *rozeboomi* Vargas, 1941, Gaceta Medica de Mexico 69:393 (Type locality: Campeche, Mexico) (new synonym).

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[1] The writer is indebted to Alan Stone, H. R. Roberts, W. C. Reeves, and E. B. Johnson for valuable assistance and loans of specimens.

Male.—Head integument yellow; recumbent scales of occiput golden, erect scales and setae amber-yellow. Eyes black. Tori yellow, nude except for a few minute hairs on inner sides; antennae brown, terminal two segments black. Clypeus yellow, nude. Palpi elongate, slender; scales golden on basal three segments except toward tip of third; terminal two segments with muddy-yellow integument, scales smokey-black, erect setae prominent and blackish-yellow. Proboscis entirely yellow-scaled only in basal half, with an increasing mixture of blackish scales distad, entirely black at apex, labellum black.

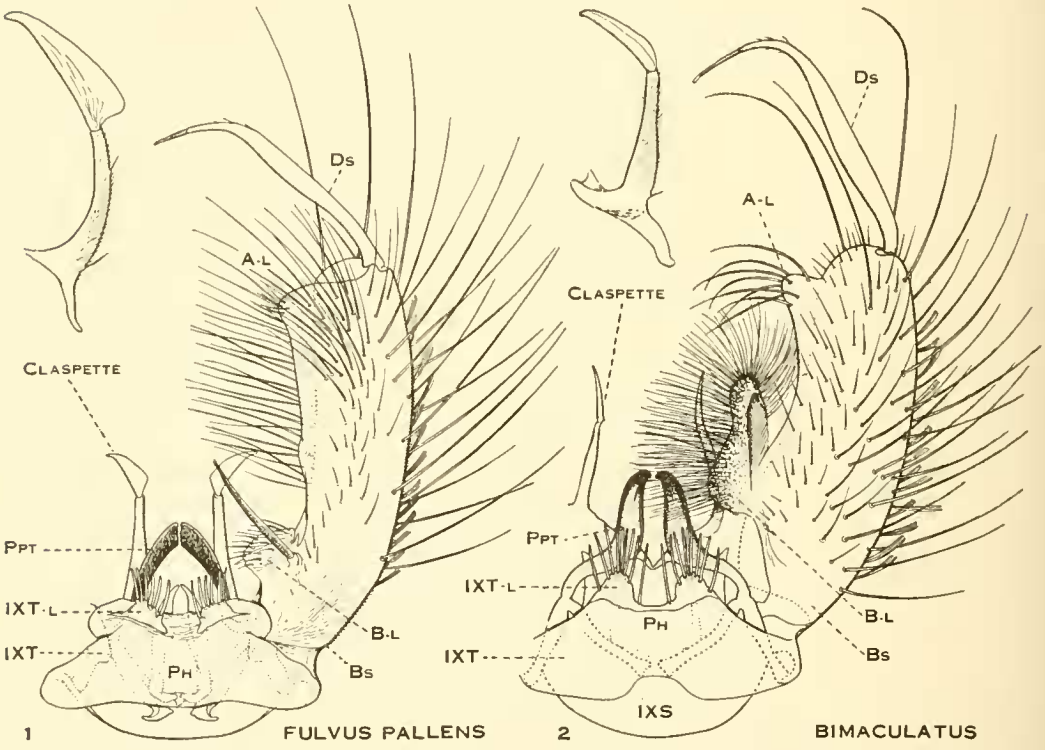

Figure 1, Male terminalia of *Aedes fulvus pallens* n. subsp., holotype with side view of claspette. Figure 2, Male terminalia of *Aedes bimaculatus* (Coq.), topotype, with side view of claspette. *Explanation of symbols:* (A–L) apical lobe, (B–L) basal lobe, (Bs) basistyle, (Ds) dististyle, (IXT) ninth tergite, (IXT–L) lobe of IXT, (IXS) ninth sternite, (PH) phallosome, (PPT) paraproct.

Thorax with integument (except mesonotal spots) lemon-yellow throughout, slightly darker in mid-dorsal line of mesonotum; scutellum blackish. Mesonotum with two conspicuous ebony-black spots sub-basally, the margins rounded, uninterrupted, abrupt; clothed with a mixture of golden and piceous recumbent hairs except over the black spots where these hairs are all black; erect setae amber-yellow. Pleural integument immaculate yellow; scales of prealar area and upper half of mesepimeron silver. *Wings* with scales smokey-black, except at extreme base of costal veins where they are yellow. *Legs:* coxae and trochanters with integument, scales, and setae yellow. Femora of fore- and mid-legs yellow-scaled on outer side with a mixture of blackish scales, somewhat concentrated medially; hind femora with only yellow scales on outer side; apices of all femora with

an abrupt tip of black scales. Tibiae of fore- and mid-legs largely smokey-black scaled on outer sides; apices shaggy, gradually darkened; hind tibiae narrowly dark-scaled at base and broadly so at apex, some scales erect. Fore-tarsi entirely dark; mid-tarsi dark except toward base of basal segment; hind tarsi dark scaled except at basal two-thirds of basal segment.

Abdomen with uniform, broad, golden-scales throughout venter and on terminal half of dorsum; basal tergites increasingly mixed with black scales until almost entirely black-scaled on segments I and II.

Male terminalia (fig. 2) as illustrated. Salient features: Basistyle (Bs) stout; setae rather sparse, especially on venter; two very large, long,

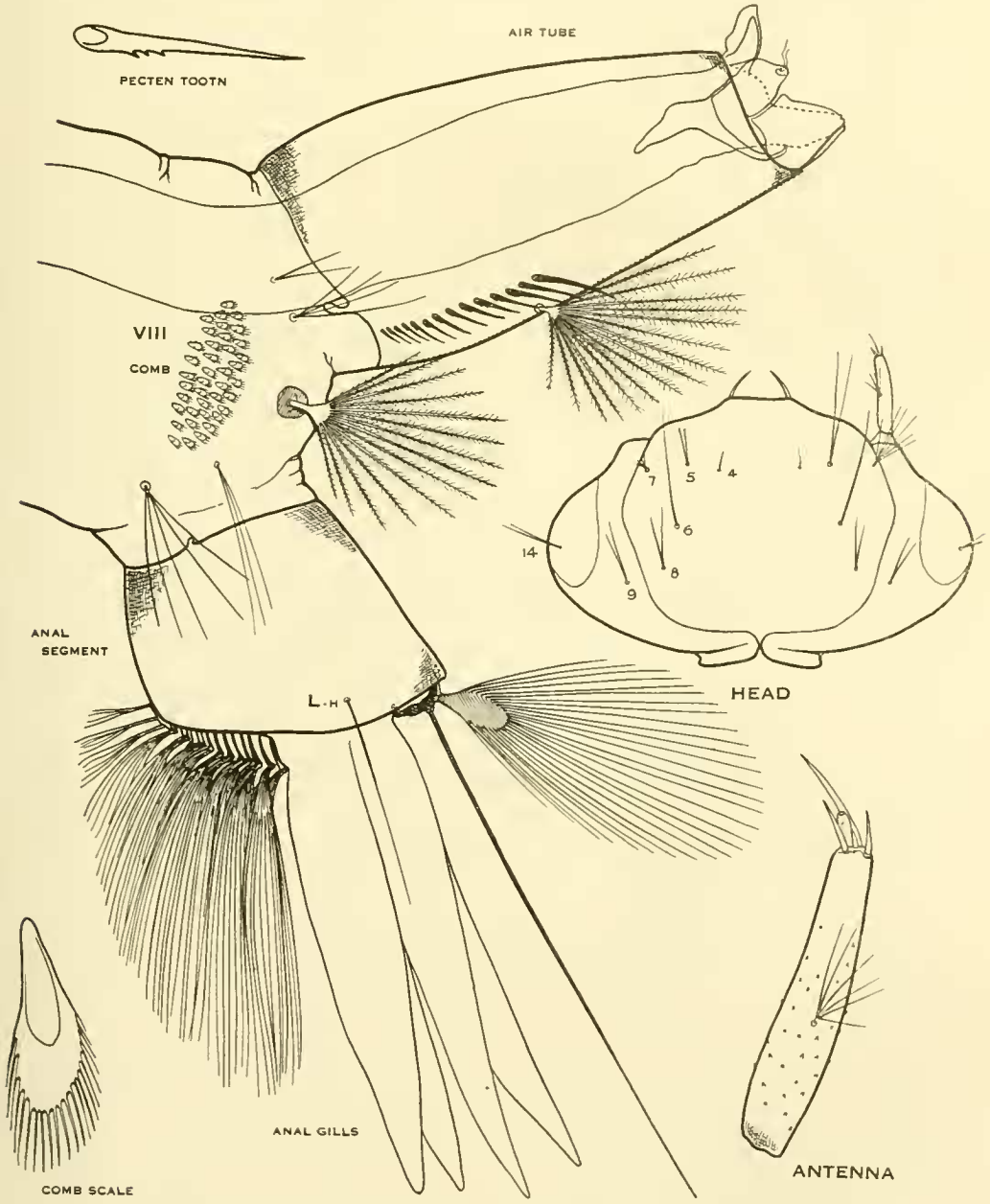

Figure 3, *Aedes bimaculatus* (Coq.), fourth instar larval characters. Specimen from San Benito, Texas.

apically curved setae arise subapically on venter; apical lobe (A-L) prominent, rounded, setae prominent, evenly curved basad; basal lobe (B-L) very conspicuous, half as long as basistyle, dark, very densely clothed with slender hairs, dorsal spine absent. Claspette filament (from side) rather slender, as figured.

Female: Very similar in coloration to male, except as follows: Proboscis with darker scales extending farther basad; tarsi more nearly completely dark; wings with more extensive gold scales on base of C and R_1. Abdomen with only a few dark scales on basal half of dorsum, almost completely golden-scaled. All claws toothed except those of hind tarsi.

Larva (fourth instar) (fig. 3): *Head* as figured, antennae very short. *Prothorax* with hairs 1 and 2 long, single; hair 3 fine, 2-branched; hair 4 finely 3-branched; hairs 5 and 6 long, single; hair 7 prominent, 3-branched from base; hair 8 small, single; hairs 9–11 fine, single, arise from common sclerite; hair 13 large, fan-shaped, many-branched. *Mesothorax* with hair 1 fine, single; hair 4 small, 4-branched at apical half; hair 3 finely 3-branched from base; hair 4 finely 7-branched from base; hair 5 a single prominent hair; hairs 6, 8, and 9 large multibranched, fan-shaped, hair 7 single; hair 13 small, multi-branched from base. *Metathorax* with hairs 8 and 9 fan-shaped but only half as large as those of mesothorax. *Abdomen:* dorsal lateral hairs (6) double on segments I and II, single on remaining segments; ventral hair of segment VI very conspicuous, rhizoid, many-branched. Terminal segments as figured; comb scales oval; pecten teeth extending just beyond ventral tuft of air tube, evenly spaced; lateral hair of anal segment single.

Holotype: female, Brownsville, Texas, June 16 (C. H. T. Townsend). Cat. No. 6259, U. S. National Museum.

Redescribed specimens: Male and female, from Brownsville, Texas, September 27, 1942 (E. S. Ross and H. R. Roberts).

Other specimens examined: TEXAS—Brownsville, VIII–30–16 (M. M. High), 2 ♀; Brownsville, VIII–25 (A. Price), 1 ♀; Ft. Brown (Brownsville) VII–9-42, 8 ♀; Brownsville, V–17–42, (Reeves, Brookman, Eads) 1 ♂, 5 larvae; Palmetto State Park, Luling, IX–15–42 (Roberts and Ross) 1 ♀ biting. MEXICO—San Blas, XI–03 (A. Duges) 1 ♀. EL SALVADOR—San Miguel, 1940, 1 ♀.

The male terminalia characters of *bimaculatus* are very distinctive and set the species well apart from *fulvus*. The larval differences between *bimaculatus* and *fulvus pallens*, on the other hand, are relatively slight. Adults of both sexes of these species may be separated as follows: *fulvus* has apical triangular areas of black scales on all abdominal tergites, thoracic pleura with at least one black integumental spot (*fulvus pallens*) or two longitudinal black stripes (*fulvus fulvus*); *bimaculatus*, with scarcely any black scales on tergites except toward base of abdomen, thoracic pleura yellow—no integumental maculation,

It is apparent, thanks to his clear photographs of the male terminalia, that Vargas (1940) correctly identified specimens from Campeche, Mexico, as *bimaculatus*. Later (1941), however, perhaps noting the published terminalia figures of specimens incorrectly identified as *bimaculatus*, he concluded that his specimens represented a new species which he named *rozeboomi*. This name must now become a synonom of *bimaculatus*.

Little is known of the biology of *bimaculatus*. W. C. Reeves (in lit.) collected larvae of the species in a roadside ditch near San Benito, Texas, May 11, 1942. He noted a remarkable appearance in the larva; the head and only the sixth and seventh abdominal segments being dark, the remainder of the body being transparent and exhibiting the internal organs. He reared males from these larvae which proved to be *bimaculatus*. On September 27, 1942, near Brownsville, Lt. H. R. Roberts and the writer collected a large series of adults and pupae of the species. The adults, many recently emerged, were resting on grass growing in and around large, clear, semi-permanent roadside pools which had apparently been fed by flood water from the Rio Grande River. Although a careful search was made, no larvae of the species were taken. The fact that only pupae and adults were present in abundance during such a limited period indicated a simultaneous development perhaps resulting from the eggs of a previous generation being flooded all at the same time. If such a non-continuous breeding is the rule, it would explain the infrequency with which the species is collected. Many other mosquitoes were found breeding in these puddles, as follows: *Anopheles quadrimaculatus*, *pseudopunctipennis*, *albimanus; Psorophora ciliata*, *confinnis*, *discolor*, *signipennis; Culex erraticus*. The species is attracted to light and bites man at night.

Aedes (Ochlerotatus) fulvus fulvus (Wiedemann).[2]

Culex fulvus Wiedemann, 1828, Ausser. Zweifl. Ins., 1:546.
Culex ochripes Maquart, 1850, Dipt. Exot., Suppl. 4, part 1, p. 315.
Culex flavicosta Walker, 1856, Ins. Saund. p. 431.

The writer has before him the *fulvus* material in the U. S. National Museum from many localities in Central and South America. Representatives from Panama are described as follows:

Male.—Head integument and recumbent scales pale yellow, erect scales setae golden-yellow. Eyes black. Tori large, orange, naked except for a few fine brown hairs on inner sides; clypeus naked, yellow. Palpi longer than proboscis; first segment with integument brown; second segment with integument brown at extreme base only, clothed with golden scales except

[2] The extensive bibliography of this species is not included, but its synonyms are listed.

over dark base and extreme apex where the scales are smokey-black; third segment golden scaled except at extremities, greatly expanded in distal fourth, roughened ventrally and clothed with long golden hairs, two large bristles on dorsal apex; fourth segment dark scaled at basal and distal thirds, partially golden medially, densely clothed ventrally with long golden hairs, terminal segment slender, entirely clothed with shaggy black scales, sparse long black bristles dorsally, and dense long hairs ventrally. Proboscis entirely clothed with golden scales except at extreme apex where it is black.

Thorax with mesonotal integument lemon-yellow except for the subbasal spots; each spot is transversely divided medially by a yellow area, the spots are brownish-black with blending margins; clothed with bright golden recumbent hairs; except over and mesad of spots where these hairs are black. Pleural integument lemon-yellow with two longitudinal brownish-black bands, one extending caudad from side of anterior promontory of mesonotum to prealar sclerite, the lower band crossing middle of sternopleural sclerite and covering lower half of mesepimeron. The upper half of the latter sclerite and the prealar area are clothed with broad flattened silver scales. *Wings* with scales of C, Sc and R_1 golden, other scales yellowish-brown. *Legs:* coxae and trochanters lemon-yellow; femora with all scales yellow, except for those forming abrupt black tip; tibiae largely yellow-scaled except at extremities, scales rather uplifted; fore-tarsi largely yellow-scaled, except at tips of terminal segments; mid- and hind-tarsi with terminal four segments black-scaled, basal segment yellow-scaled except at extreme base and at terminal fourth.

Abdomen golden-scaled beneath and on dorsum except for triangular apical areas of black scales.

Male terminalia without significant differences from that described later for *fulvus pallens* (fig. 1).

Female.—Very similar in coloration and vestiture to male. The palpi are black-scaled at the apical third. Wings with scales of C, Sc and R_1 golden except at terminal fourth of wing. Abdomen with dark-scaled areas of tergites covering apical half, somewhat produced forward medially. All claws toothed except those of hind tarsus.

Holotype: Female, deposited in Frankfurter Museum. Type locality: "Brasilien."

Distribution.—Widespread in the Neotropical Region. The writer has examined specimens in the U. S. National Museum from Panama Canal Zone, Panama, Trinidad, Guatemala, Nicaragua, Brazil, Bolivia, and Peru.

Aedes (Ochlerotatus) fulvus pallens, new subspecies.

(Figures 1 and 4.)

This name is proposed for the "*bimaculatus*" of the southeastern United States which has been long misidentified as either *Aedes bimaculatus* (Coquillett) or *Aedes fulvus* (Wiedemann),

Holotype male: Similar to *fulvus* from Panama but differing in the following details: Palpi with terminal dark scales paler, ventral vestiture of long golden hair of terminal segments almost absent on distal segment, this segment clothed on all sides with long brownish hairs. *Thorax* with mesonotal spots not divided, darker brown in color, rather abruptly limited in outline; pleurae almost entirely immaculate, only one small, inconspicuous brown spot below the mesothoracic spiracle. *Abdomen* with dorsal triangles of dark scales smaller in size.

Terminalia (fig. 1): Without significant differences from that of typical

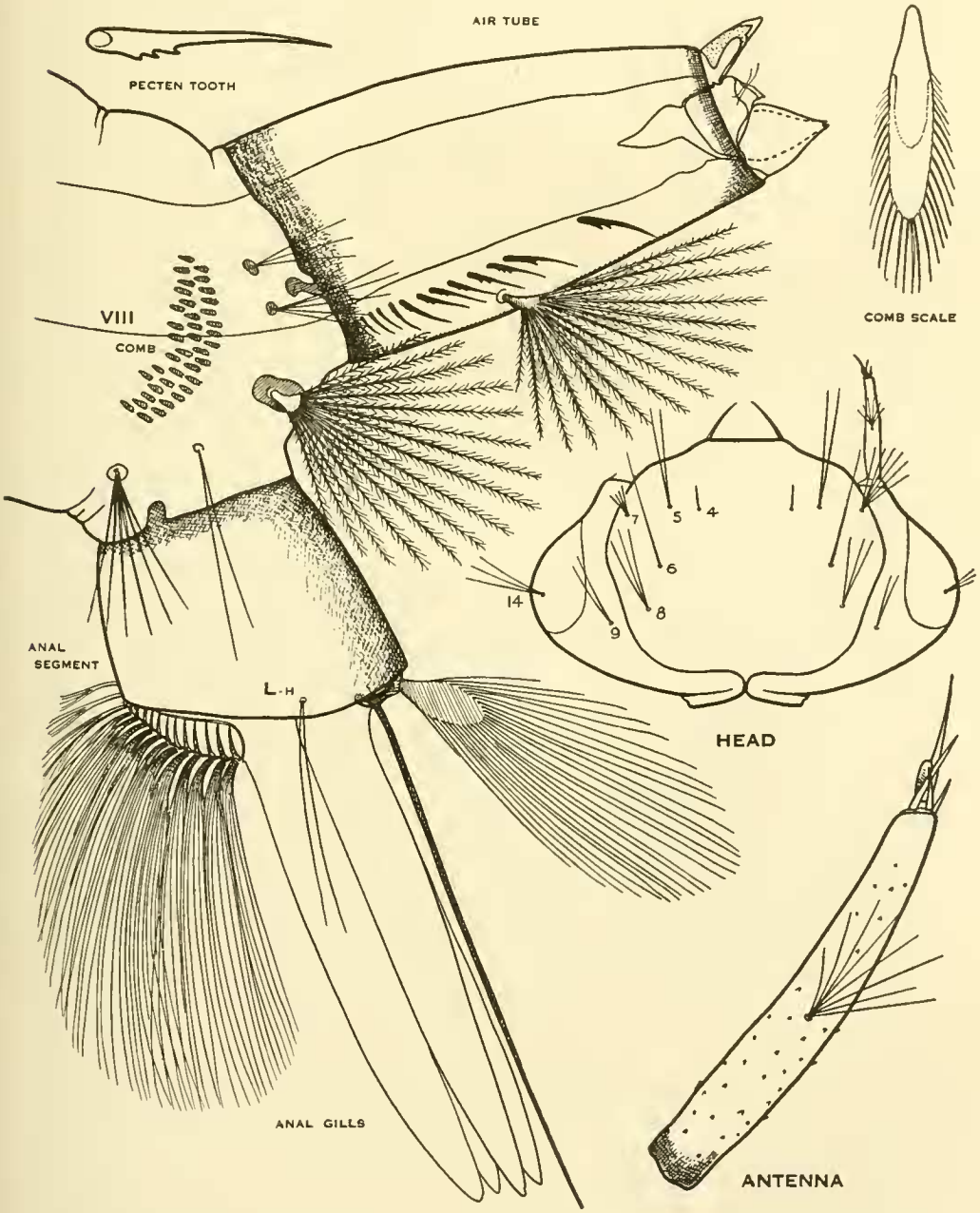

Figure 4, *Aedes fulvus pallens* n. subsp. fourth instar larval characters. Specimen from Bienville Parish, Louisiana.

fulvus. Salient characters: basistyle (Bs) rather slender; elongate, setae very dense distally on dorsal surface and along inner margin of venter, apical lobe (A–L) small, setae inconspicuous; basal lobe (B–L) small, somewhat flattened, spines short, directed mesad, arising from prominent sockets, with a conspicuous dorsal spine crossing its surface which is minutely barbed at tip; claspette filament (from side) broad, blade-shaped.

Allotype female: Similar to male in coloration but with black scales of abdominal tergites more restricted to apical margin (other specimens have the normal dark *fulvus*-like tergites.)

Larva (fourth instar) with important characters as illustrated (fig. 4).

Holotype: Male (terminalia on slide), and allotype female, New Orleans, Louisiana, September 10, 1914 (W. V. King) deposited in the U. S. National Museum.

Specimens examined.—LOUISIANA—Baton Rouge (Dupree) 2 larvae; Baton Rouge, IX–02 (H. A. Morgan), 1 female; Baton Rouge, X–16–02, 1 male; New Orleans, IX–24–02 (G. E. Beyer), 1 female; New Orleans, IX–10–14 (W. V. King) 1 female, 2 larvae; same data, X–2–14, 1 female; Bienville Parish, VI–12–39 (E. B. Johnson) 3 larvae, 2 terminalia; Leesville, VII–42 (R. W. Bunn), 2 males; MISSISSIPPI—Belzona, VIII–4–04 (H. S. Barber), 1 female; Natchez, VI–9–10 (A. Fleming), 1 female. SOUTH CAROLINA—Georgetown, IX–20–33 (C. C. C. Survey) 3 females. MARYLAND—Shadey Grove, VI–30–34 (C. C. C. Survey), 1 female. The subspecies has also been recorded from many localities of almost all of the southeastern states—usually as *bimaculatus*.

Because of the lack of apparent terminalia differences between the United States series and that from Panama, and because the more superficial characters such as color and vestiture are relatively slight, though constant, the United States series is placed as a subspecies of *fulvus*. *Pallens* can be separated at once from typical *fulvus* by the almost complete absence of pleural maculation of the thorax and by the greater development of the mesothoracic spots. *Bimaculatus* is readily distinguished from both by the darker, ebony-black mesothoracic spots, absence of any pleural maculation, darker wings, and legs, abdomen with tergites almost entirely golden-scaled, and the terminalia characters so distinct that they can be seen under a low power binocular microscope without preparation.

Barret (1919) has given a few details regarding the biology of this subspecies. He reported the larvae occurring in fairly large numbers in a semi-permanent sink-hole of muddy water following heavy rains, July, 1916, at Charlotte, North Carolina. The larvae rested nearly parallel to the surface and were dark brown in color. This latter point is of interest as a possible further point of differentiation of larvae of this species from *bimaculatus* which has partially colorless larvae. King (1942) reports the females to be severe biters.

Attempts have been made, using terminalia characters, to show that more than one species of the *fulvus* group occurs within the range of *pallens*. The writer feels that the characters used are either within the range of variation of the subspecies or due to distortions resulting from slide preparation.

Literature Cited.

Barret, H. P., 1919, Observation on the life history of *Aedes bimaculatus* Coq. (Diptera, Culicidae) Ins. Insc. Mens., 7:63–64.

Vargas, L., 1940, *Aedes bimaculatus* Coquillett, 1904, del Estado de Campeche, Mexico. Description de Macho. Rev. Soc. Mex. Hist. Nat., 1:103–107, figs.

——— 1941, *Aedes* (*Ochlerotatus*) *rozeboomi* nueva especie (Dipt. Culicidae). Gaceta Medica de Mexico 69:393–395.

A NEW GENUS AND SPECIES OF THYSANOPTERA FROM NEW ZEALAND (Family Thripidae)

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In this paper there is described another of the interesting forms sent by Donald Spiller for determination. The species is dedicated to him for his efforts in collecting Thysanoptera with full and exact data in a region from which previously almost nothing was known.

OTHINANAPHOTHRIPS, new genus.

Belongs to the Anaphothripini; antenna distinctly 9-segmented, with segments 7–9 forming a style; body not strongly reticulated; trichomes on segments 3 and 4 forked; ocelli in macropterous form fully developed; prothorax without any long setae; comb on tergum VIII complete, of simple spines; fore vein of anterior wing with an irregular row of setae on its entire length, hind vein with many setae; sterna of male with peculiar glandular areas (fig. 1, C); armature of apical segments of male also peculiar.

Type, *Othinanaphothrips spilleri*, new species.

To this genus must also be assigned *Hemianaphothrips tersus* Morison.

This genus differs from *Hemianaphothrips* Priesner in having the anterior vein of the forewing completely (though irregularly) spined and the comb on tergum VIII not medially made up of plates apically drawn out into 1–4 spines, in possessing